INVERTER DRIVE SUPERMARKET

Easy Start Guide

Parker SSD Drives
650 Series Frequency Inverter
available from Parker.InverterDrive.com

This guide is intended to compliment the user manual provided by the manufacturer.
It is provided as a basic introduction to the product for Inverter Drive Supermarket customers.
It should not be used as a replacement for the manual issued by the manufacturer.

This product is not a safety device. All safety considerations including but not limited to Emergency Stop provision should be assessed separately and are outside the scope of this guide.

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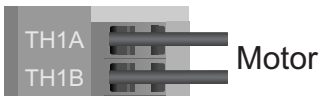
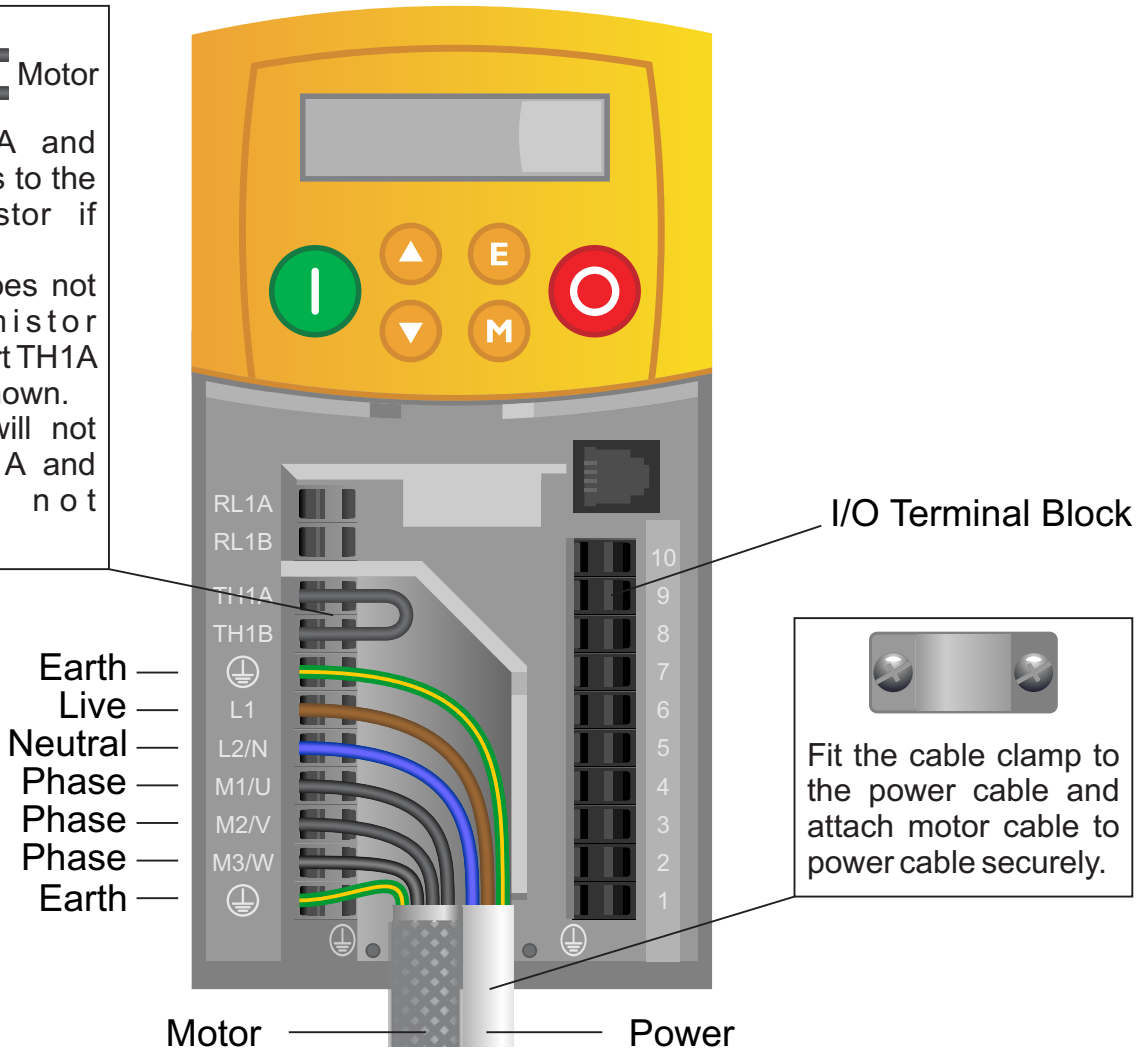
1. Power and Motor Connections (Single Phase)

Before commencing, confirm that the Inverter and all cables are completely isolated from the power supply, have been isolated for at least 5 minutes and that the motor is not turning.



Connect TH1A and TH1B terminals to the motor thermistor if available.
If the motor does not have thermistor protection, short TH1A and TH1B as shown.
The Inverter will not operate if TH1A and TH1B are not connected.



Fit the cable clamp to the power cable and attach motor cable to power cable securely.

Notes:

The illustration above is based on frame size 1 models (0.25kW - 0.75kW). The terminal layout for sizes 2 and 3 (1.1kW - 2.2kW) is slightly different.
The order of the three phases determines the direction the motor turns.

Important:

Use screened SY cable between the Inverter and Motor to minimise electromagnetic interference.

Ensure the motor cable screen is earthed at the motor end.

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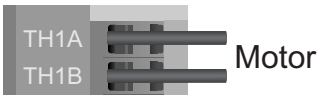
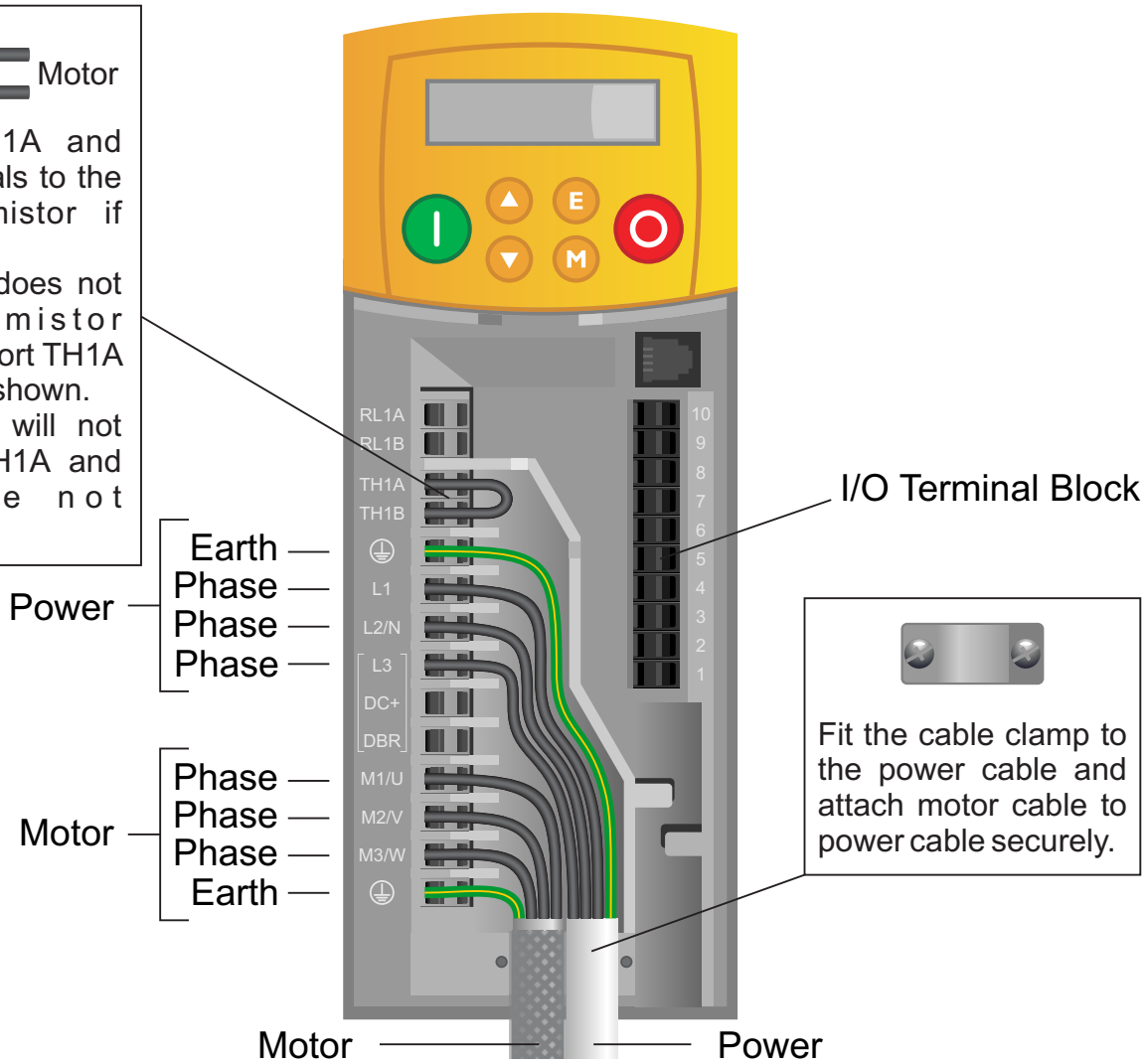
2. Power and Motor Connections (Three Phase)

Before commencing, confirm that the Inverter and all cables are completely isolated from the power supply, have been isolated for at least 5 minutes and that the motor is not turning.



Motor

Connect TH1A and TH1B terminals to the motor thermistor if available.
If the motor does not have thermistor protection, short TH1A and TH1B as shown.
The Inverter will not operate if TH1A and TH1B are not connected.



Fit the cable clamp to the power cable and attach motor cable to power cable securely.

Notes:

The illustration above is based on frame size 2 models (0.37kW - 2.2kW). The terminal layout for size 3 (3kW - 7.5kW) is slightly different.
The order of the three motor phases determines the direction the motor turns.
The order of the three power phases is unimportant.

Important:

Use screened SY cable between the Inverter and Motor to minimise electromagnetic interference.

Ensure the motor cable screen is earthed at the motor end.

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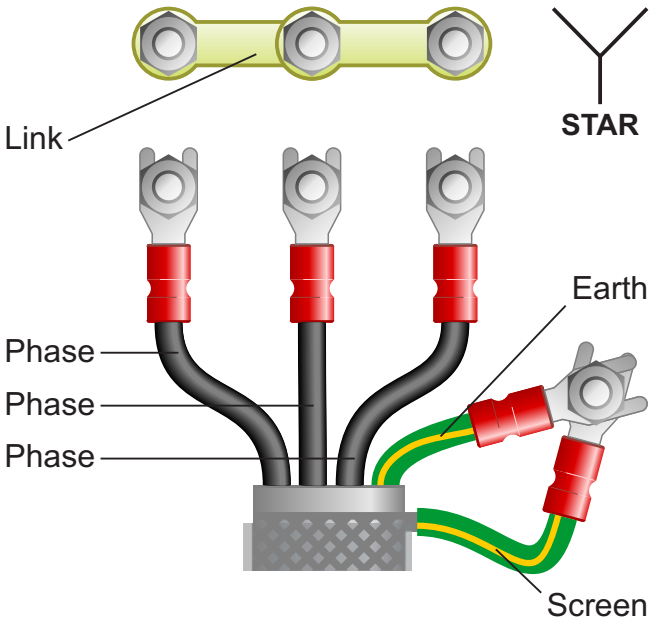
3. Motor Connections - Star and Delta

Dual voltage induction motors typically include terminal boxes with six points. The points can be connected together with links in one of two ways to suit one of the two rated voltages.

The two ways of connecting the links are shown below. These are known as “Star” (the higher voltage) or “Delta” (the lower voltage).

The selection of Star or Delta is not optional and must match the supply voltage.

Dual voltage motor nameplates include symbols to represent voltage and full load current in each configuration.
Delta is represented by a triangle and star by a Y (Wye).



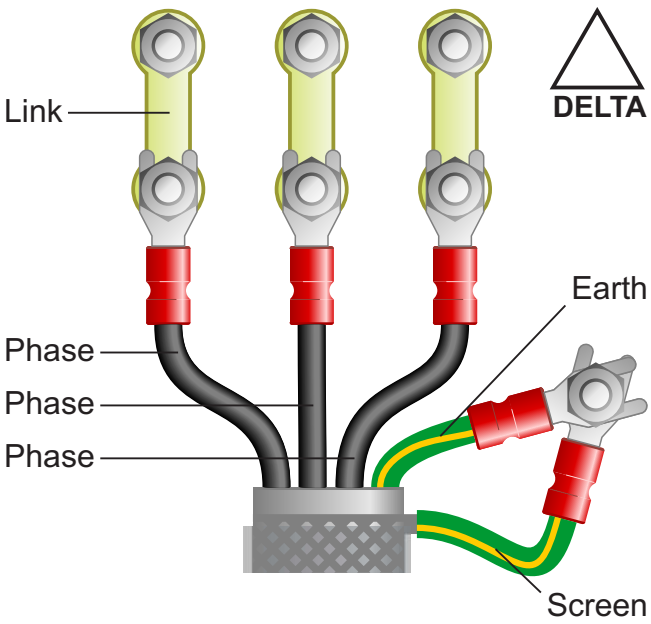
3.1 Motor connected in STAR (or Wye):

For safety purposes, Star (shown opposite) is the default configuration for new motors and is sometimes known as “two at one side”.

Only two links are required for Star. Double-up the links if changing from Delta to allow the motor to be changed to back in future.

The order of the three phases determines the direction the motor turns.

Note that the cable screen and earth are connected together at the earth terminal.



3.2 Motor connected in DELTA:

The link configuration is shown in the illustration opposite and is sometimes referred to a “three-a-breast”.

The order of the three phases determines the direction the motor turns.

Note that the cable screen and earth are connected together at the earth terminal.

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4. Parameters - overview

The Inverter contains a number of settings which can be changed to tailor it for use in a wide range of applications. These settings are known as parameters.

Parameters are typically referred to by code or number (eg. P6 = Motor Full Load Current) with a description available in the manual.

The parameters contain critical information essential to the correct operation of the Inverter. Therefore, they should at least be checked by the user before it is operated for the first time.
The parameters listed in section 5 are intended to provide a starting point to allow for basic operation of the 650 Inverter.

5. Parameters to set before use

Set the following parameters to allow the 650 to run in standard mode with Run, Stop and Speed Control from the keypad.

If any of the parameters have been changed previously, follow the procedure in section 13 to reset the Inverter to Factory Defaults.

See section 7 to learn how to set a parameter value.

5.1 Parameters to check and values to set

Parameter	Description	How to set
P2	Maximum Speed in Hz	Default is 50 or 60 depending on region. Set at **50** for 50Hz motor.
P3	Minimum Speed as % of P2	Default is 0. Set to **0** for most applications.
P6	Motor Current in Amps	Set to match motor nameplate - eg. 4.7
P7	Base Frequency in Hz	Default is 50. Change to 60 for 60Hz motor only - otherwise set at **50**.
P13	Fixed Boost (%)	*See section 6 for details of how to correctly set this value.*

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6. How to set “Boost” - Parameter P13

Boost is an important parameter to set to get the best possible motor performance.
Correctly set, it significantly improves torque at lower speeds. However, it is not relevant for Fan and Centrifugal Pump applications.

The procedure involves running the motor off-load at it’s rated speed and making a note of output current. The motor is then run at 10% speed and P13 adjusted to ensure that the output current is the same in both cases.

6.1 How to determine “Motor no-load current” by operating the 650.

6.1.1 Set speed to 100% and start the motor.

Motor no-load current can only be determined with the motor running off-load. Decouple the motor from the machine before beginning!

Use the up key to increase speed to 100% (50Hz or 60Hz depending on motor) and press the green button to start the motor. Once the motor is running at 100%, proceed to the next step.

6.1.2 Press “M” to open the menu.

Press and hold the “M” button until the display shows “diag” as illustrated.

Press “M” again to open the diagnostics (diag) menu.

6.1.3 Use the up and down keys to locate output current.

Output current can be identified by the letter “A” on the top right as shown.

Make a note of this value. It is “Motor no-load current” in Amps.

Leave the motor running and continue to the next step overleaf.

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6.2 How to use “Motor no-load current” to set Boost correctly.

6.2.1 Reduce motor speed to 10%.

Press the “E” (escape) key twice to return to the speed display. Then press and hold the down key to reduce the speed from 100% to 10%.

Once the motor is running at 10%, proceed to the next step.

6.2.2 Use the diagnostics menu to find output current.

Press and hold the “M” button until the display shows “diag” as before. Press “M” again to open the diagnostics menu.
Use the up and down keys to locate output current as before.

If the current value shown is more than motor no-load current, the Boost value in P13 will need to be reduced. If it is less, P13 will need to be increased.

6.2.3 Locate parameter P13 and change as required.

From the output current display in the previous step, press “E” to return to “diag” then up and down to locate “par” as shown.

Press “M” to open the parameter list then up and down to locate P13. Press “M” again to edit it.

6.2.4 Change P13, save and check output current.

Use the up and down keys to increase or decrease the value of P13 as necessary. Press “E” to save and “E” to return to “par”, then “E” again to return to the speed display.

Repeat step 6.2.2 to check output current. If it matches motor no-load current Boost is set correctly and the motor can be stopped using the red button.
If the output current does not match, repeat steps 6.2.3 and 6.2.4 until it does.

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7. How to set a Parameter value

7.1 Press and hold the “M” (Menu) key for 1 second.

This example demonstrates the steps required to set parameter 6 (P6) which is motor full-load current.

From the speed reference screen (shown in the illustration opposite), press and hold the Menu key for approximately 1 second to access the menu.

7.2 Press the up key to move from Diagnostics to Parameters.

The display shows “diag” to indicate that the currently selected menu option is “diagnostics”.
Press the up key to select the parameter menu. The display will show “par” to indicate that this has been selected.

7.3 Press the Menu key to access the parameter list.

When the display shows “par”, press the Menu key to access the parameter list.

7.4 The Parameter List

The display shows P1 to indicate that Parameter 1 is currently selected.
Use the up and down keys to navigate through the list of available parameters.
For this example, select P6 (motor full-load current).
Press the Menu key to modify the parameter value.

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7.5 Use the Menu, up and down keys to change the value.

Press the Menu key to select the first digit. The selected digit will flash to indicate that it can be changed.
Use the up and down keys to increase or decrease the value.
Press the Menu key again to move through each digit from right to left. Continue to press Menu to cycle back to the first digit.

7.6 Press the “E” (Escape) key to return to the Parameter List.

Press the Escape key to return to the parameter list. The previously selected parameter number is shown.
Use the up and down arrows to select a different parameter and press the Menu key to modify as before.
Press the Escape key again to return to the Parameter menu as shown in 7.3.

7.7 Press the Escape key to return to the speed reference screen.

When the display shows “par”, press the Escape key to return to the initial screen.

7.8 The initial screen

The drive is now back at the speed reference screen.

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8. How to operate the Inverter (Local mode)

8.1 Use the up and down keys to set the required speed.

The display will change to show the current speed reference in percent.

8.3 Press the green button to start the motor.

Press the green button firmly to start the motor. The motor will accelerate to the speed set in 8.1 (above) in the time defined by parameter P4.

Motor speed can be changed whilst the motor is running by pressing and holding the down key (slower) or up key (faster). When the motor is running, the shaft-end symbol on the left side of the screen will rotate.

8.4 Press the red button to stop the motor.

The red button will stop the motor.

The time taken (in seconds) to stop the motor is determined by parameter P5.

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9. How to switch from Local (keypad) control to Remote (terminal) control and back

9.1 Press and hold the stop button.

When the drive is in Local control mode a small hand symbol is shown on the right side of the display.

Press and hold the stop button to switch the Inverter from Local control via the keypad to Remote control via the IO terminals.

Keep the stop button held down.

9.2 "LOC" is displayed.

The display shows "LOC" and each letter disappears one at a time whilst the Inverter switches to remote control.

Keep the stop button held down.

9.3 The display shows "rdy".

Once the process is complete the display shows "rdy" (ready) and the stop button can be released.

If the display immediately switches back to local control (ie. the hand symbol is still visible) a run signal is present. Check the IO terminals and disable the run signal before attempting this procedure again.

9.4 To switch back to Local control.

Press and hold the stop button as before to switch back to local control. The display will show "LOC" with each letter appearing in sequence as the Inverter switches to local control. Keep the stop button held down.

Once the process is complete a hand symbol appears on the right side of the display. The stop button can now be released.

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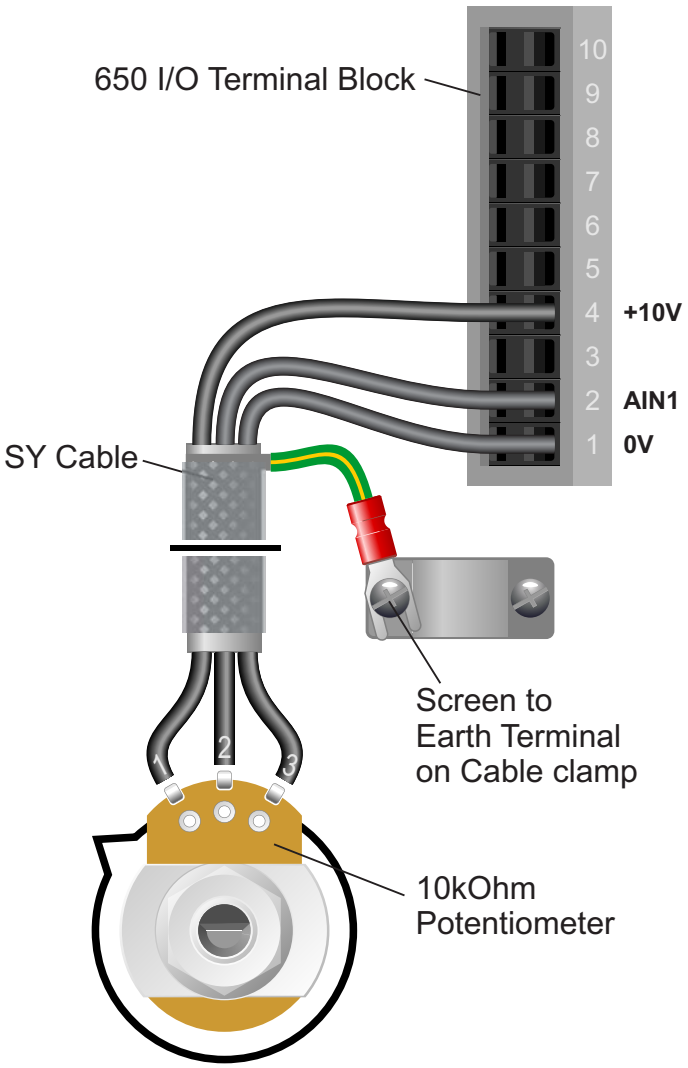
10. How to connect and configure a Potentiometer for remote speed control

If the up and down speed control buttons on the keypad are unsuitable for the application, a remote Potentiometer can be used instead.
This provides the benefit of allowing motor speed to be controlled from a more convenient location such as a cabinet door (if the 650 is cabinet-mounted) or on the machine itself.

A Potentiometer of **10kOhm** rating should be used.
The number of turns depends on the application but both single turn and ten turn Potentiometers are available from The Inverter Drive Supermarket at InverterDrive.com.

10.1 Connecting the Potentiometer



To use a external potentiometer, the Inverter must be set to operate in “Remote” mode - see section 9 for details.

A wiring diagram is shown in the illustration opposite. The most important connection at the Potentiometer end is the centre terminal or “wiper”.

The wiper will output a variable voltage between 0 and 10 volts and should be connected to terminal 2 (AIN1) at the Inverter end. It is this voltage which provides the speed signal with 0V being slowest and 10V fastest.

The default speed at 0V is 0%. To change this, edit parameter P3.

The default speed at 10V is 50Hz or 60Hz depending on region. To change this, edit parameter P2.

If the rotation of the Potentiometer is the opposite to that required (ie. turn anti-clockwise to increase speed instead of clockwise) reverse connections +10V and 0V.

Use shielded SY cable between Potentiometer and Inverter and ensure that the cable screen

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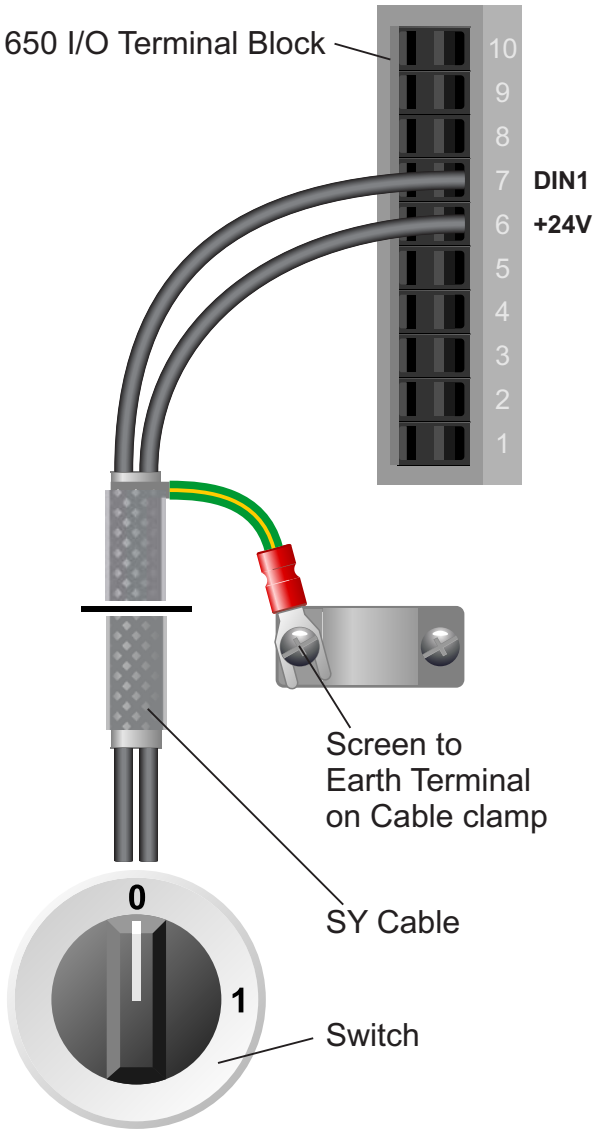
11. How to connect and configure a Run/Stop switch

The default settings of the Inverter enable Run/Stop operation via the red and green buttons on the keypad.
If this is unsuitable for the application, a remote Run/Stop switch can be used instead.

Note that once this procedure is complete, the Run/Stop buttons on the keypad can no longer be used.

11.1 Connecting the Run/Stop Switch



To use a external Run/Stop switch, the Inverter must be set to operate in “Remote” mode - see section 9 for details.

A wiring diagram is shown in the illustration opposite.

When terminal 7 (DIN1) receives 24V (ie. when the circuit with terminal 6 (+24V) is complete), Run is enabled and motor will turn. Conversely, when it receives 0V (ie. when the circuit with +24V is broken), Run is disabled and the motor will stop.
This behaviour is known as a **Digital Input,** hence Digital Input 1 (DIN1).

Any +24V DC signal connected to DIN1 will cause the Inverter to run. This can be useful if an external source such as a PLC is controlling the Inverter. If the +24V DC signal is external, a connection to +24V is not required.

Use shielded SY cable between Potentiometer and Inverter and ensure that the cable screen is earthed at the cable clamp on the Inverter as shown opposite.

Note that although 2 core SY cable is shown in the illustration opposite, multi-core SY cable can be used if several digital inputs are to be used.

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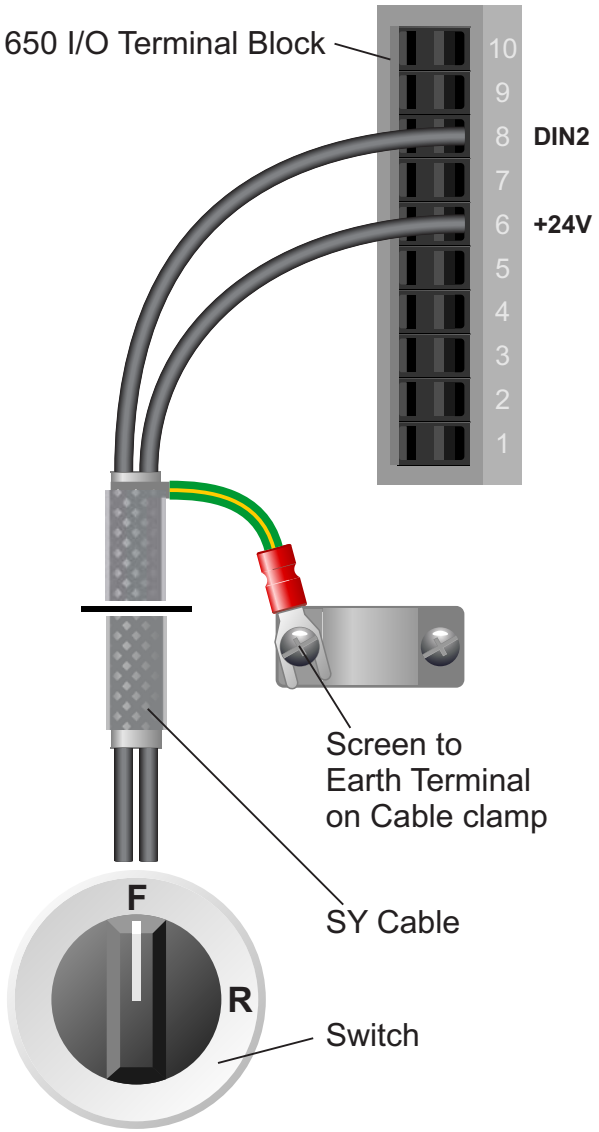
12. How to connect and configure a Fwd/Rev switch

The default settings of the Inverter enable Run/Stop operation via the red and green buttons but do not allow forward and reverse rotation to be selected via the keypad.

Section 11 explains how to enable remote Run/Stop via a external switch.
This section extends the functionality added in section 11 to include a Forward/Reverse switch as well.

12.1 Connecting the Fwd/Rev Switch



To use a external Fwd/Rev switch, the Inverter must be set to operate in “Remote” mode - see section 9 for details.

A wiring diagram is shown in the illustration opposite.

Note that this switch should be used in conjunction with a Run/Stop switch as described in section 11.

When the switch is in position “F” (forward), the circuit between terminal 8 (DIN2) and terminal 6 (+24V) is incomplete and the motor direction is set to forward.
When the switch is in position “R” (reverse), the circuit between DIN2 and +24V is complete and the motor direction is set to reverse.
This behaviour is known as a **Digital Input,** hence Digital Input 2 (DIN2).

Any 24V DC signal from an external source such as a PLC connected to DIN2 will set the direction of rotation.

Use shielded SY cable between the switch and Inverter and ensure that the cable screen is earthed as described in section 11.

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13. How to reset the Inverter to Factory Defaults

13.1 Power-on with up and down keys pressed

With the power supply to the drive off, press and hold the up and down arrow keys and switch the power supply on.

13.2 Release up and down keys when “data” is displayed.

When the display flashes “data”, release the up and down keys.
Press the “E” (Escape) key to continue.

13.3 Drive initialises

The display briefly shows “init” to indicate that the drive is initialising.

13.4 Reset complete

Once the reset is completed the display shows the speed reference screen (as shown in the illustration opposite) and the drive is ready.

Note that the “hand” icon indicates that the drive is in local mode (control via keypad only). See section 9 for more information regarding Local and Remote control modes.

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14. Notes

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